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SOLAR/1008-79/03

Monthly Performance Report

HOMES BY MARILYNN

MARCH 1979

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

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MONTHLY PERFORMANCE REPORT

HOMES BY MARILYNN

JUNE 1979

I. SYSTEM DESCRIPTION

The Homes by Marilynn site is a single-family residence in Albuquerque, New Mexico. Solar energy is used for space heating the home and preheating domestic hot water (DHW). The solar energy system has an array of flat-plate collectors with a gross area of 335 square feet. The array faces south at an angle of 55 degrees to the horizontal. A mixture of 35 percent ethylene glycol and 65 percent water is the transfer medium that delivers solar energy from the collector array to a liquid-to-liquid heat exchanger in the storage loop. It also delivers solar energy to a liquid-to-air heat exchanger in the space heating subsystem in order to preheat outside air for the heat pump. Solar energy is stored underground in a 1000-gallon water storage tank. The city supply water is preheated by continuously circulating water from a preheat tank through a heat exchanger in the storage tank. Preheated city water is stored in a 30-gallon preheat storage tank and supplied, on demand, to a conventional 40-gallon DHW tank. When solar energy is insufficient to satisfy the space heating load, a heat pump and an electrical heating element in the air-handling unit provide auxiliary energy for space heating. Similarly, an electrical heating element in the DHW tank provides auxiliary energy for water heating. The system, shown schematically in Figure 1, has five modes of solar operation.

Mode 1 - Collector-to-Storage: This mode activates when the temperature at the top of the collector is 10°F higher than the temperature in storage.

Mode 2 - Storage-to-Space Heating: This mode activates when there is a demand for space heating and the storage temperature is higher than 85°F.

Mode 3 - Storage-to-DHW Tank: This mode is active at all times with water continuously circulating between the DHW preheat tank and the storage tank.

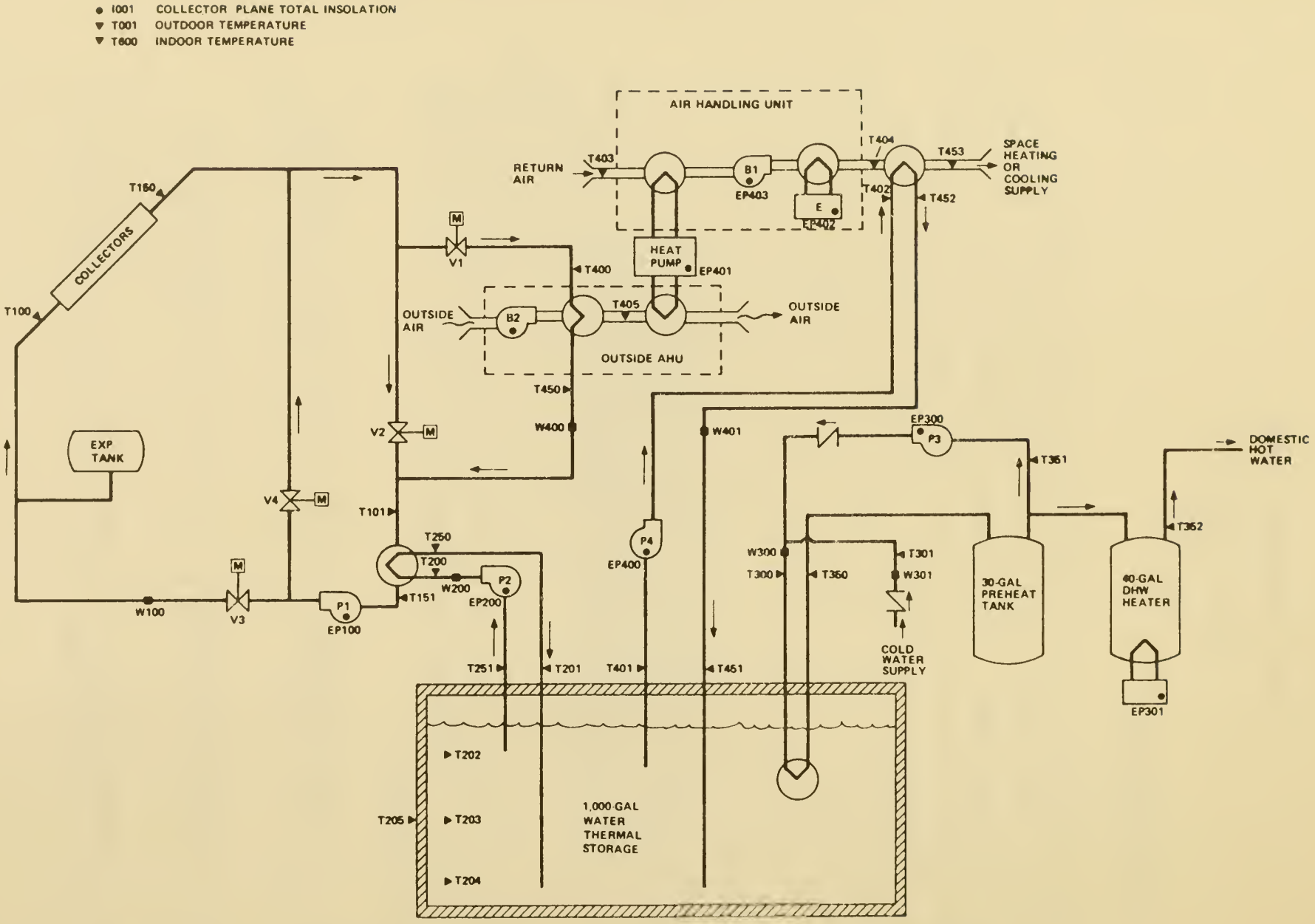

Figure 1. HOMES BY MARILYNN SOLAR ENERGY SYSTEM SCHEMATIC

Mode 4 - Collector-to-Storage and Heat Pump Assist: This mode activates when the conditions for mode 1 are satisfied, there is a demand for heat pump assistance for space heating, and the temperature of storage is higher than 135°F. During this mode, the outside air that is transferred across the heat pump coil is preheated.

Mode 5 - Storage-to-Preheat Assist: This mode activates when there is no flow through the collector, the temperature of storage is higher than 135°F, and a demand for heat pump assistance for space heating exists. The collector loop heat exchanger obtains energy from storage to preheat the outside air that is transferred across the heat pump coil.

II. PERFORMANCE EVALUATION

INTRODUCTION

The site was occupied in June and the solar energy system operated continuously during the month. Total solar energy collected was 3.0 million Btu and the amount of solar energy used was 1.3 million Btu or 42 percent of the collected energy. The change in stored energy was 0.073 million Btu and the total system losses amounted to 1.7 million Btu. Solar energy satisfied 76 percent of the DHW requirements. There was no space heating requirement during the month. The solar energy system provided an electrical energy savings of 0.15 million Btu.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 14.2 million Btu for a daily average of 1526 Btu per square foot. This was below the estimated average daily solar radiation for this geographical area during June of 1774 Btu per square foot for a south-facing plane with a tilt

of 55 degrees to the horizontal. The average ambient temperature during June was 73°F as compared with the long-term average for June of 75°F. The number of heating degree-days for the month (based on a 65°F reference) was 24, as compared with the long-term average of zero. The number of cooling degree-days was 264, as compared with the long-term average of 291.

The ambient temperature sensor (T001) provided erroneous values intermittently during the month. The affect on the average temperature reading appears to be negligible: the average ambient temperature measured at another solar installation in this geographical area was also 73°F. The average daytime ambient, however, (measured from the three hours before solar noon until three hours following solar noon) was 9°F higher at the Homes by Marilynn site when compared to the other installation.

THERMAL PERFORMANCE

System - During June the solar energy system performed somewhat poorer than expected. The expected performance was determined from a modified f-chart analysis using measured weather and subsystem loads as input. Solar energy used by the system was estimated by assuming that all energy collected would be applied to the load. Actual solar energy used was 1.3 million Btu versus an estimated 1.6 million Btu. System total solar fraction was 76 percent versus an estimated 100 percent.

Collector - The total incident solar radiation on the collector array for the month of June was 14.2 million Btu. During the period the collector loop was operating, the total insolation amounted to 10.7 million Btu. The total collected solar energy for the month of June was 3.0 million Btu, resulting in a collector array efficiency of 21 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 3.4 million Btu.

The apparent 0.4 million Btu gain in solar energy delivered to storage over the amount collected is an obvious impossibility. The flow rates measured by

sensors W100 and W200 should remain constant throughout a period of continuous collection. A variation of 15 to 20 percent, however, was measured on sensor W100. The source of this variation has not been determined. Potential sources are: an erroneous measurement capability through the flow sensors, actual flow variance caused by the collector pump, and/or inconsistent operation of valves V1 and V2.

Storage - Solar energy delivered to storage was 3.4 million Btu. There were 1.3 million Btu delivered from storage to the DHW subsystem. Energy loss from storage was 2.0 million Btu. This loss represented 60 percent of the energy delivered to storage. The storage efficiency was 40 percent: This is calculated as the ratio of the sum of the energy removed from storage and the change in stored energy, to the energy delivered to storage. The average storage temperature for the month was 142°F.

DHW Load - The DHW subsystem consumed 1.3 million Btu of solar energy and 0.32 million Btu of auxiliary electrical energy to satisfy a hot water load of 1.1 million Btu. The solar fraction of this load was 76 percent. Losses from the DHW subsystem were 0.46 million Btu. The DHW subsystem consumed a total of 0.23 million Btu of operating energy, resulting in an electrical energy savings of 0.77 million Btu. A daily average of 85 gallons of DHW was consumed at an average temperature of 128°F delivered from the tank.

Space Heating Load - There was no space heating required during June.

OBSERVATIONS

The effectiveness of the solar energy system in June was limited by the combination of large hot water utilization during short periods in conjunction with a relatively small (30-gallon) DHW preheat tank. Electrical energy is frequently required to heat the water in the DHW tank to satisfy the thermostat setting. This is because the replenishment water from the preheat tank does not always have enough time to be heated from the stored solar energy prior to the next hot water demand.

The solar system provided 1.3 million Btu of solar energy to the system loads. Operation of the solar energy system equipment consumed 65 percent (0.85 million Btu) of that amount in electrical energy while collecting and distributing solar energy.

The space heating subsystem is designed to utilize solar energy as long as the storage temperature is higher than 85°F. Measurements of storage indicate that the use of solar energy for space heating terminates when the storage temperature decreases to 105°F. The constantly cycling DHW preheat loop continues to extract energy from storage as long as there is a demand in the DHW preheat tank. Storage must then be reheated to 105°F in order to replace the storage losses and the energy used by the DHW preheat. Then solar energy space heating can be accomplished.

In order to heat the house, mode 4 and mode 5 require the use of the heat pump and a storage temperature of at least 135°F. The heat pump is only used to heat the house upon a second-stage thermostat heating requirement (house temperature is "n" degrees less than the thermostat setting). The only time that these criteria can be met is when mode 2 is not functioning. Since the valves and flow rate in the collector loop are potential sources of the imbalance in energy calculations, elimination of the heat pump assist functions may be worth considering.

ENERGY SAVINGS

The solar energy system provided a net electrical energy savings of 0.15 million Btu. The DHW subsystem provided an electrical energy savings of 0.77 million Btu. The collection and storage subsystems incurred an electrical energy expense of 0.62 million Btu.

III. ACTION STATUS

Flow rate variance through the collector flow rate sensor (W100) is affecting the energy collection calculation. An investigation is continuing to determine

whether the measurement sensor or an erratic flow is the cause. Elimination of the heat pump assist loop is being considered by the grantee and Boeing.

Boeing is planning to replace the temperature sensor (T100) that measures the outside ambient temperature.

The grantee is evaluating whether the deactivation of the solar portion of the space heating subsystem is acceptable at a 105°F storage temperature or whether it should be corrected to operate in the 85°F design level.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: HOMES BY MARILYN
REPORT PERIOD: JUNE,1979

SOLAR/1008-79/06

SITE/SYSTEM DESCRIPTION:
HOMES BY MARILYN IS A SINGLE FAMILY DWELLING. THE HEAT PUMP IS ASSISTED BY SOLAR ENERGY DURING THE HEATING CYCLE. NO SOLAR ENERGY IS USED IN ASSISTING THE COOLING CYCLE OF THE HEAT PUMP. HOWEVER, A DOMESTIC HOT WATER LOAD IS REQUIRED YEAR-ROUND.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	14.193 MILLION BTU
	45785 BTU/SQ.FT.
COLLECTED SOLAR ENERGY	3.029 MILLION BTU
	9771 BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	73 DEGREES F
AVERAGE BUILDING TEMPERATURE	79 DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.09
ECSS OPERATING ENERGY	0.619 MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	0.848 MILLION BTU
TOTAL ENERGY CONSUMED	4.201 MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	1.146	0.000	N.A.	1.146 MILLION BTU
SOLAR FRACTION	76	0	N.A.	76 PERCENT
SOLAR ENERGY USED	1.285	0.000	N.A.	1.285 MILLION BTU
OPERATING ENERGY	0.229	0.000	N.A.	0.848 MILLION BTU
AUX. THERMAL ENERGY	0.324	0.000	N.A.	0.324 MILLION BTU
AUX. ELECTRIC FUEL	0.324	0.000	N.A.	0.324 MILLION BTU
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. MILLION BTU
ELECTRICAL SAVINGS	0.769	0.000	N.A.	0.150 MILLION BTU
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.294

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978. SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: HOMES BY MARILYN
REPORT PERIOD: JUNE,1979

SOLAR/1008-79/06

SITE/SYSTEM DESCRIPTION:
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GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	14.974 GIGA JOULES
	519929 KJ/SQ.M.
COLLECTED SOLAR ENERGY	3.195 GIGA JOULES
	110955 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	23 DEGREES C
AVERAGE BUILDING TEMPERATURE	26 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.09
ECSS OPERATING ENERGY	0.653 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	0.894 GIGA JOULES
TOTAL ENERGY CONSUMED	4.432 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	1.209	0.000	N.A.	1.209 GIGA JOULES
SOLAR FRACTION	76	0	N.A.	76 PERCENT
SOLAR ENERGY USED	1.356	0.000	N.A.	1.356 GIGA JOULES
OPERATING ENERGY	0.241	0.000	N.A.	0.894 GIGA JOULES
AUX. THERMAL ENG	0.342	0.000	N.A.	0.342 GIGA JOULES
AUX. ELECTRIC FUEL	0.342	0.000	N.A.	0.342 GIGA JOULES
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. GIGA JOULES
ELECTRICAL SAVINGS	0.811	0.000	N.A.	0.156 GIGA JOULES
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.294

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: HOMES BY MARILYN
REPORT PERIOD: JUNE,1979

SOLAR/1008-79/06

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	0.466	59	0.043	N	0.017	N	0.092
2	0.391	63	0.027	O	0.018	O	0.068
3	0.464	67	0.014	T	0.025	T	0.030
4	0.345	65	0.019		0.019		0.055
5	0.266	64	0.021	A	0.016	A	0.081
6	0.539	71	0.049	P	0.025	P	0.090
7	0.460	75	0.031	P	0.019	P	0.068
8	0.117	59	0.022	L	0.002	L	0.184
9	0.467	57	0.027	I	0.019	I	0.058
10	0.537	64	0.041	C	0.024	C	0.077
11	0.572	69	0.037	A	0.026	A	0.064
12	0.537	73	0.056	B	0.026	B	0.104
13	0.565	76	0.028	L	0.026	L	0.050
14	0.492	76	0.060	E	0.019	E	0.122
15	0.439	77	0.059		0.014		0.134
16	0.450	78	0.034		0.019		0.075
17	0.597	76	0.032		0.026		0.053
18	0.544	74	0.023		0.019		0.043
19	0.550	67	0.054		0.021		0.099
20	0.541	68	0.080		0.024		0.148
21	0.531	79	0.050		0.021		0.095
22	0.464	81	0.051		0.021		0.109
23	0.503	80	0.043		0.028		0.086
24	0.502	78	0.055		0.022		0.109
25	0.529	81	0.077		0.024		0.145
26	0.558	84	0.040		0.026		0.071
27	0.506	85	0.058		0.024		0.114
28	0.536	86	0.060		0.025		0.112
29	0.506	83	0.062		0.017		0.123
30	0.222	75	0.033		0.008		0.149
SUM	14.193	-	1.285	N.A.	0.619	N.A.	-
AVG	0.473	73	0.043	N.A.	0.021	N.A.	0.091
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: HOMES BY MARILYN
REPORT PERIOD: JUNE,1979

SOLAR/1008-79/06

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	0.466	0.344	0.085	69	0.182
2	0.391	0.247	0.056	*	0.144
3	0.464	0.368	0.105	78	0.227
4	0.345	0.258	0.046	81	0.133
5	0.266	0.131	0.011	69	0.042
6	0.539	0.445	0.141	83	0.262
7	0.460	0.361	0.110	87	0.239
8	0.117	0.027	0.011	62	0.092
9	0.467	0.330	0.084	66	0.179
10	0.537	0.435	0.121	76	0.226
11	0.572	0.476	0.144	84	0.252
12	0.537	0.449	0.137	90	0.256
13	0.565	0.461	0.135	94	0.239
14	0.492	0.353	0.100	94	0.202
15	0.439	0.253	0.075	91	0.172
16	0.450	0.314	0.088	93	0.196
17	0.597	0.479	0.130	90	0.218
18	0.544	0.395	0.106	85	0.195
19	0.550	0.411	0.116	77	0.210
20	0.541	0.438	0.129	88	0.239
21	0.531	0.403	0.117	97	0.221
22	0.464	0.350	0.104	100	0.224
23	0.503	0.419	0.113	98	0.224
24	0.502	0.375	0.095	90	0.190
25	0.529	0.442	0.134	98	0.253
26	0.558	0.467	0.138	98	0.248
27	0.506	0.412	0.126	102	0.249
28	0.536	0.439	0.136	105	0.254
29	0.506	0.359	0.113	101	0.224
30	0.222	0.097	0.021	*	0.095
SUM	14.193	10.737	3.029	-	-
AVG	0.473	0.358	0.101	87	0.213
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
ø DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: HOMES BY MARILYN
REPORT PERIOD: JUNE,1979

SOLAR/1008-79/06

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.100	0.043	-0.013	136	0.296
2	0.070	0.027	-0.005	133	0.309
3	0.117	0.014	0.031	136	0.368
4	0.061	0.019	-0.023	137	-0.065
5	0.018	0.021	-0.052	131	-1.656
6	0.165	0.049	0.053	131	0.615
7	0.127	0.031	0.028	137	0.464
8	0.004	0.022	-0.066	135	-11.119
9	0.100	0.027	0.013	131	0.398
10	0.143	0.041	0.031	134	0.504
11	0.162	0.037	0.041	139	0.476
12	0.154	0.056	0.022	143	0.504
13	0.152	0.028	0.033	146	0.402
14	0.114	0.060	-0.024	147	0.316
15	0.088	0.059	-0.033	144	0.293
16	0.099	0.034	-0.005	141	0.294
17	0.151	0.032	0.035	142	0.439
18	0.120	0.023	0.017	146	0.337
19	0.120	0.054	0.001	147	0.464
20	0.145	0.080	-0.001	147	0.543
21	0.133	0.050	0.012	148	0.470
22	0.109	0.051	-0.005	149	0.423
23	0.119	0.043	0.002	148	0.376
24	0.118	0.055	-0.004	149	0.429
25	0.135	0.077	-0.007	147	0.517
26	0.148	0.040	0.017	148	0.384
27	0.138	0.058	0.010	149	0.492
28	0.147	0.060	0.005	150	0.439
29	0.129	0.062	-0.010	150	0.405
30	0.016	0.033	-0.028	148	0.320
SUM	3.402	1.285	0.073	-	-
AVG	0.113	0.043	0.002	142	0.399
NBS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: HOMES BY MARILYN
REPORT PERIOD: JUNE,1979

SOLAR/1008-79/06

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.066	76	0.043	0.008	0.026	0.026	N	0.041	N	69	128	146
2	0.027	71	0.027	0.008	0.013	0.013	O	0.011	O	73	131	59
3	0.011	64	0.014	0.008	0.008	0.008	T	0.002	T	73	131	21
4	0.011	73	0.019	0.008	0.008	0.008		0.003		73	129	25
5	0.020	73	0.021	0.008	0.008	0.008	A	0.010	A	72	127	42
6	0.067	58	0.049	0.008	0.031	0.031	P	0.034	P	73	130	143
7	0.027	76	0.031	0.008	0.008	0.008	P	0.017	P	72	127	57
8	0.020	73	0.022	0.008	0.009	0.009	L	0.009	L	73	129	44
9	0.033	69	0.027	0.008	0.014	0.014	I	0.018	I	72	131	69
10	0.054	52	0.041	0.008	0.028	0.028	C	0.025	C	73	128	117
11	0.036	73	0.037	0.008	0.012	0.012	A	0.023	A	73	128	78
12	0.062	60	0.056	0.008	0.022	0.022	B	0.040	B	72	129	131
13	0.019	80	0.028	0.008	0.004	0.004	L	0.012	L	73	129	41
14	0.056	95	0.060	0.008	0.006	0.006	E	0.049	E	73	127	122
15	0.052	82	0.059	0.008	0.012	0.012		0.038		74	127	115
16	0.024	80	0.034	0.008	0.005	0.005		0.016		76	127	54
17	0.030	66	0.032	0.008	0.011	0.011		0.018		75	130	65
18	0.013	75	0.023	0.008	0.007	0.007		0.005		76	129	25
19	0.036	93	0.054	0.008	0.004	0.004		0.029		75	128	81
20	0.082	50	0.080	0.008	0.024	0.024		0.058		75	124	218
21	0.035	91	0.050	0.008	0.004	0.004		0.028		74	128	80
22	0.044	85	0.051	0.008	0.006	0.006		0.035		74	129	94
23	0.029	99	0.043	0.008	0.004	0.004		0.022		77	126	69
24	0.034	92	0.055	0.008	0.007	0.007		0.024		77	126	73
25	0.070	88	0.077	0.008	0.012	0.012		0.057		74	130	151
26	0.036	56	0.040	0.008	0.011	0.011		0.024		79	127	84
27	0.034	80	0.058	0.008	0.006	0.006		0.025		75	128	78
28	0.049	91	0.060	0.008	0.006	0.006		0.042		78	128	110
29	0.049	93	0.062	0.008	0.005	0.005		0.039		77	129	114
30	0.019	91	0.033	0.008	0.003	0.003		0.012		78	128	45
SUM	1.146	-	1.285	0.229	0.324	0.324	N.A.	0.769	N.A.	-	-	2550
AVG	0.038	76	0.043	0.008	0.011	0.011	N.A.	0.026	N.A.	74	128	85
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: HOMES BY MARILYN
REPORT PERIOD: JUNE.1979

SOLAR/1008-79/06

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.000	0	0.000	0.000	0.000	0.000	N	0.000	N	79	59
2	0.000	0	0.000	0.000	0.000	0.000	O	0.000	O	78	63
3	0.000	0	0.000	0.000	0.000	0.000	T	0.000	T	79	67
4	0.000	0	0.000	0.000	0.000	0.000		0.000		76	65
5	0.000	0	0.000	0.000	0.000	0.000	A	0.000	A	77	64
6	0.000	0	0.000	0.000	0.000	0.000	P	0.000	P	79	71
7	0.000	0	0.000	0.000	0.000	0.000	P	0.000	P	80	75
8	0.000	0	0.000	0.000	0.000	0.000	L	0.000	L	78	59
9	0.000	0	0.000	0.000	0.000	0.000	I	0.000	I	77	57
10	0.000	0	0.000	0.000	0.000	0.000	C	0.000	C	78	64
11	0.000	0	0.000	0.000	0.000	0.000	A	0.000	A	78	69
12	0.000	0	0.000	0.000	0.000	0.000	B	0.000	B	79	73
13	0.000	0	0.000	0.000	0.000	0.000	L	0.000	L	78	76
14	0.000	0	0.000	0.000	0.000	0.000	E	0.000	E	80	76
15	0.000	0	0.000	0.000	0.000	0.000		0.000		80	77
16	0.000	0	0.000	0.000	0.000	0.000		0.000		79	78
17	0.000	0	0.000	0.000	0.000	0.000		0.000		81	76
18	0.000	0	0.000	0.000	0.000	0.000		0.000		80	74
19	0.000	0	0.000	0.000	0.000	0.000		0.000		79	67
20	0.000	0	0.000	0.000	0.000	0.000		0.000		79	68
21	0.000	0	0.000	0.000	0.000	0.000		0.000		80	79
22	0.000	0	0.000	0.000	0.000	0.000		0.000		84	81
23	0.000	0	0.000	0.000	0.000	0.000		0.000		83	80
24	0.000	0	0.000	0.000	0.000	0.000		0.000		81	78
25	0.000	0	0.000	0.000	0.000	0.000		0.000		80	81
26	0.000	0	0.000	0.000	0.000	0.000		0.000		81	84
27	0.000	0	0.000	0.000	0.000	0.000		0.000		80	85
28	0.000	0	0.000	0.000	0.000	0.000		0.000		80	86
29	0.000	0	0.000	0.000	0.000	0.000		0.000		80	83
30	0.000	0	0.000	0.000	0.000	0.000		0.000		81	75
SUM	0.000	-	0.000	0.000	0.000	0.000	N.A.	0.000	N.A.	-	-
AVG	0.000	0	0.000	0.000	0.000	0.000	N.A.	0.000	N.A.	79	73
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

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SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: HOMES BY MARILYN
REPORT PERIOD: JUNE,1979

SOLAR/1008-79/06

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	1502	N	59	69	N	N	N
2	1261	O	63	*	O	O	O
3	1496	T	67	78	T	T	T
4	1112		65	81			
5	857	A	64	69	A	A	A
6	1739	P	71	83	P	P	P
7	1484	P	75	87	P	P	P
8	378	L	59	62	L	L	L
9	1508	I	57	66	I	I	I
10	1731	C	64	76	C	C	C
11	1845	A	69	84	A	A	A
12	1733	B	73	90	B	B	B
13	1821	L	76	94	L	L	L
14	1587	E	76	94	E	E	E
15	1415		77	91			
16	1452		78	93			
17	1927		76	90			
18	1756		74	85			
19	1773		67	77			
20	1745		68	88			
21	1713		79	97			
22	1496		81	100			
23	1621		80	98			
24	1621		78	90			
25	1706		81	98			
26	1799		84	98			
27	1632		85	102			
28	1728		86	105			
29	1631		83	101			
30	715		75	*			
SUM	45785	N.A.	-	-	-	-	-
AVG	1526	N.A.	73	87	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

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